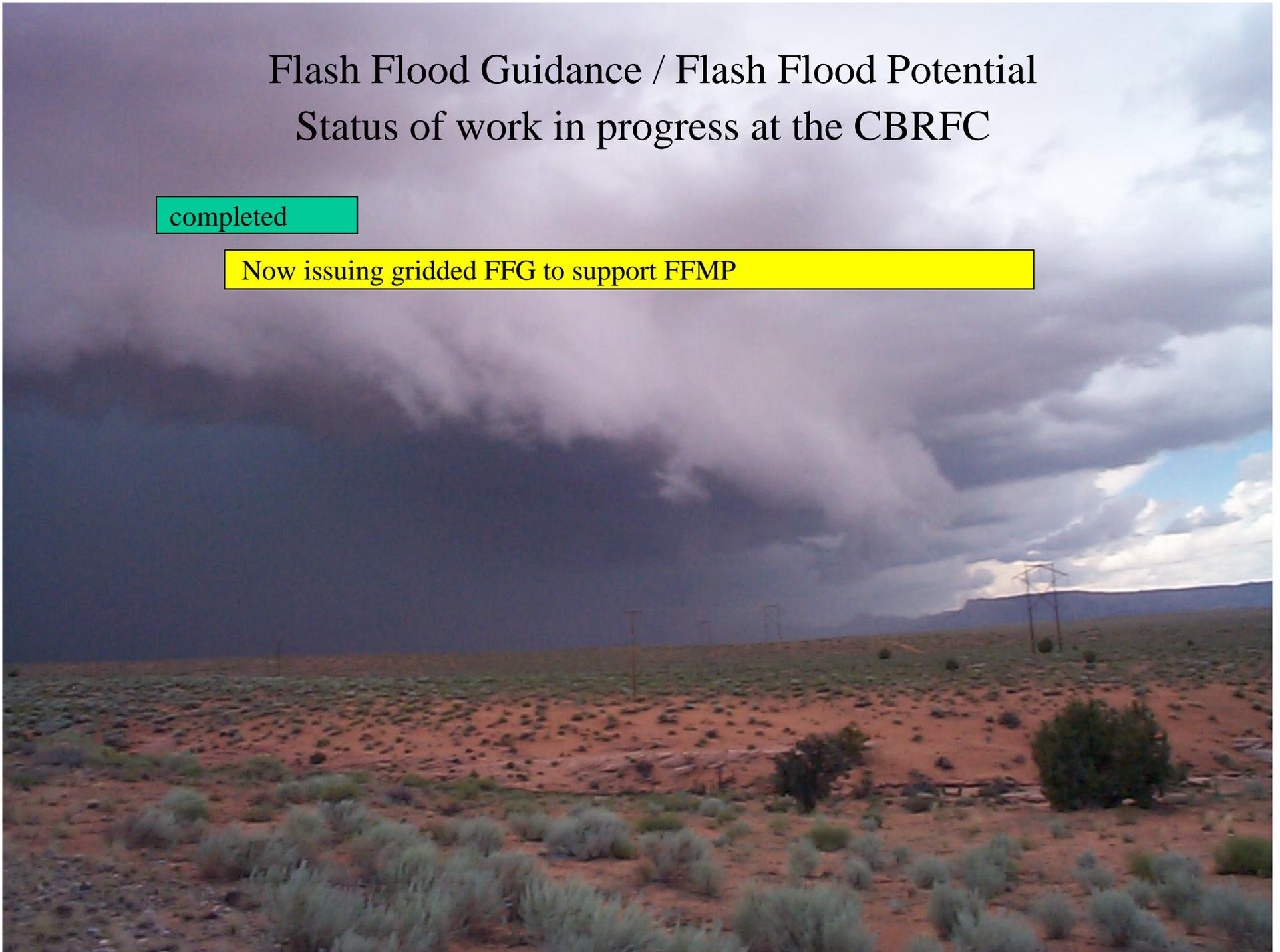


# Flash Flood Guidance / Flash Flood Potential

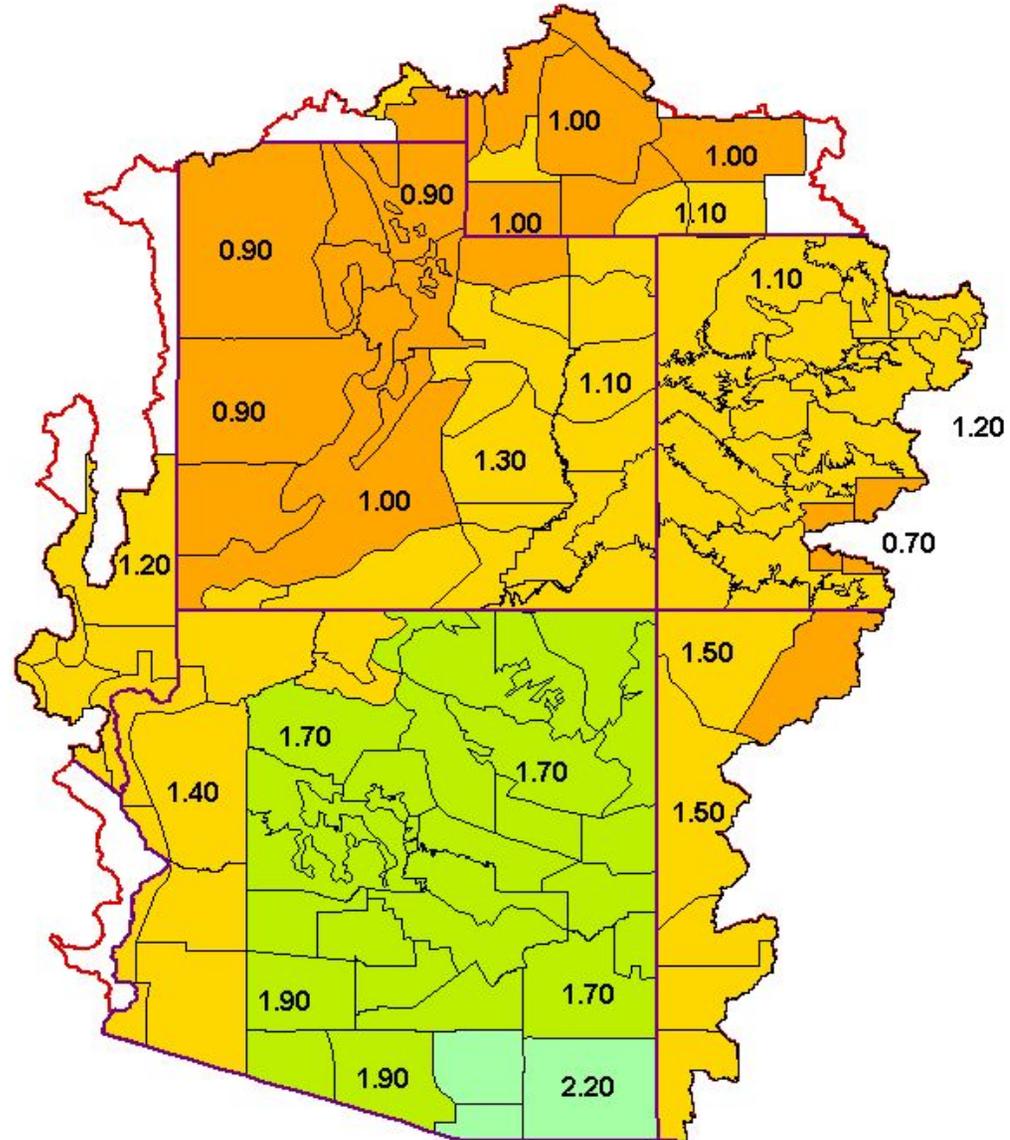
## Status of work in progress at the CBRFC

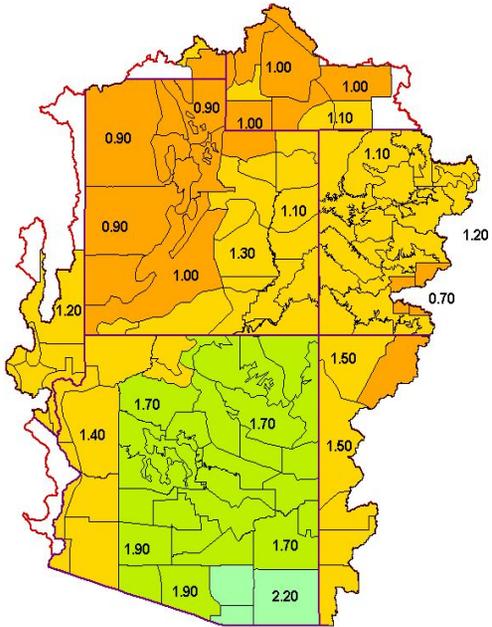
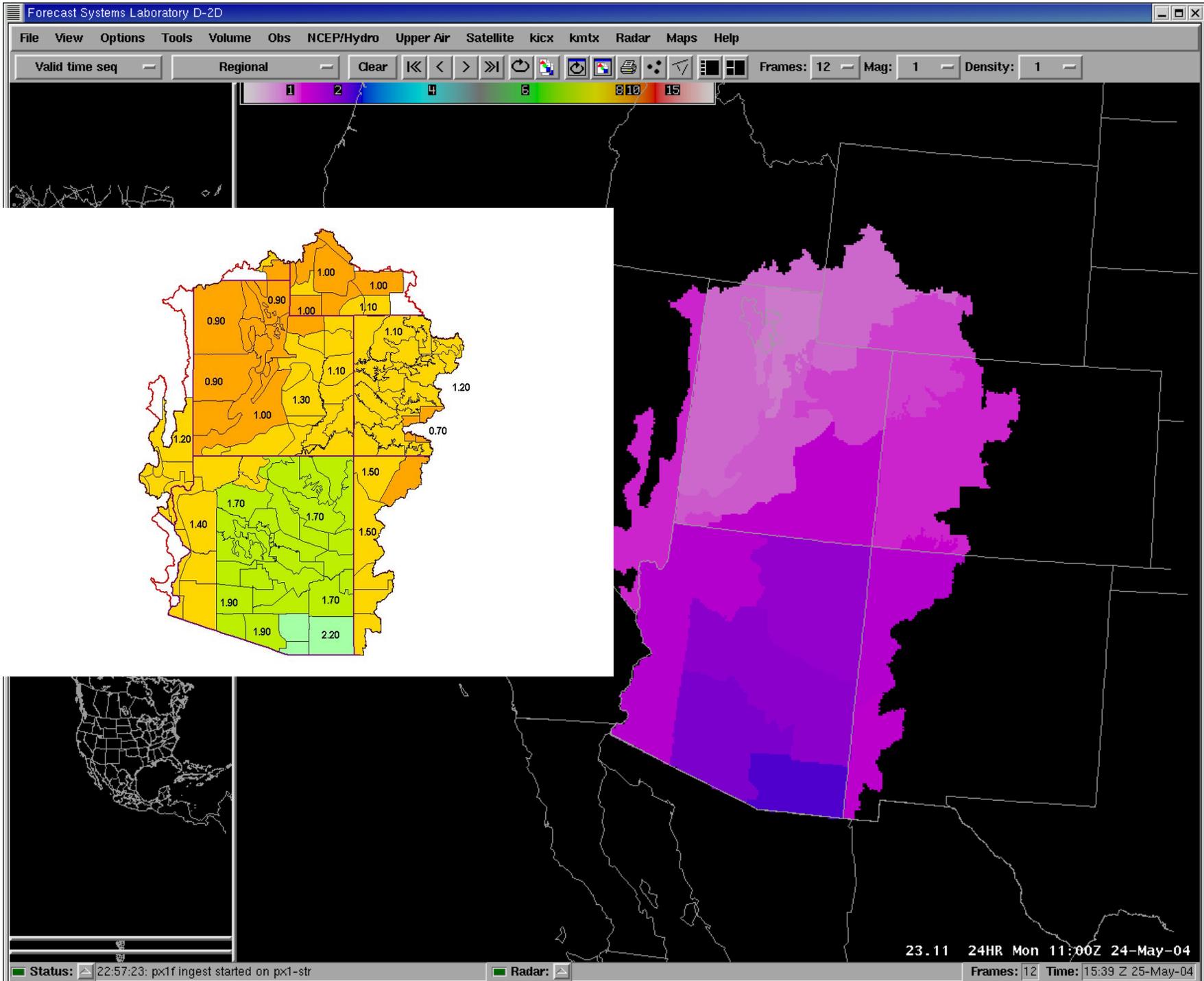
completed

Now issuing gridded FFG to support FFMP



# Existing WFO Forecast Zone FFG





# Initial Problems with Gridded FFG and FFMP

CBRFC & CNRFC D2D gridded FFG display offset

- coordinates associated with FFG must be changed / localization script run

FFG & rainfall rate updating requires precipitation within the DHR

- FFMP “semi-hibernation” mode when no DHR
- FFMP ingests new FFG once precipitation detected in the DHR data
- OB3 FFMP will update FFG and rainfall rates as long as DHR received

Forced FFG utility available (own rules of thumb, etc.)

- RFC issued FFG will not overwrite (depending on expiration date set)

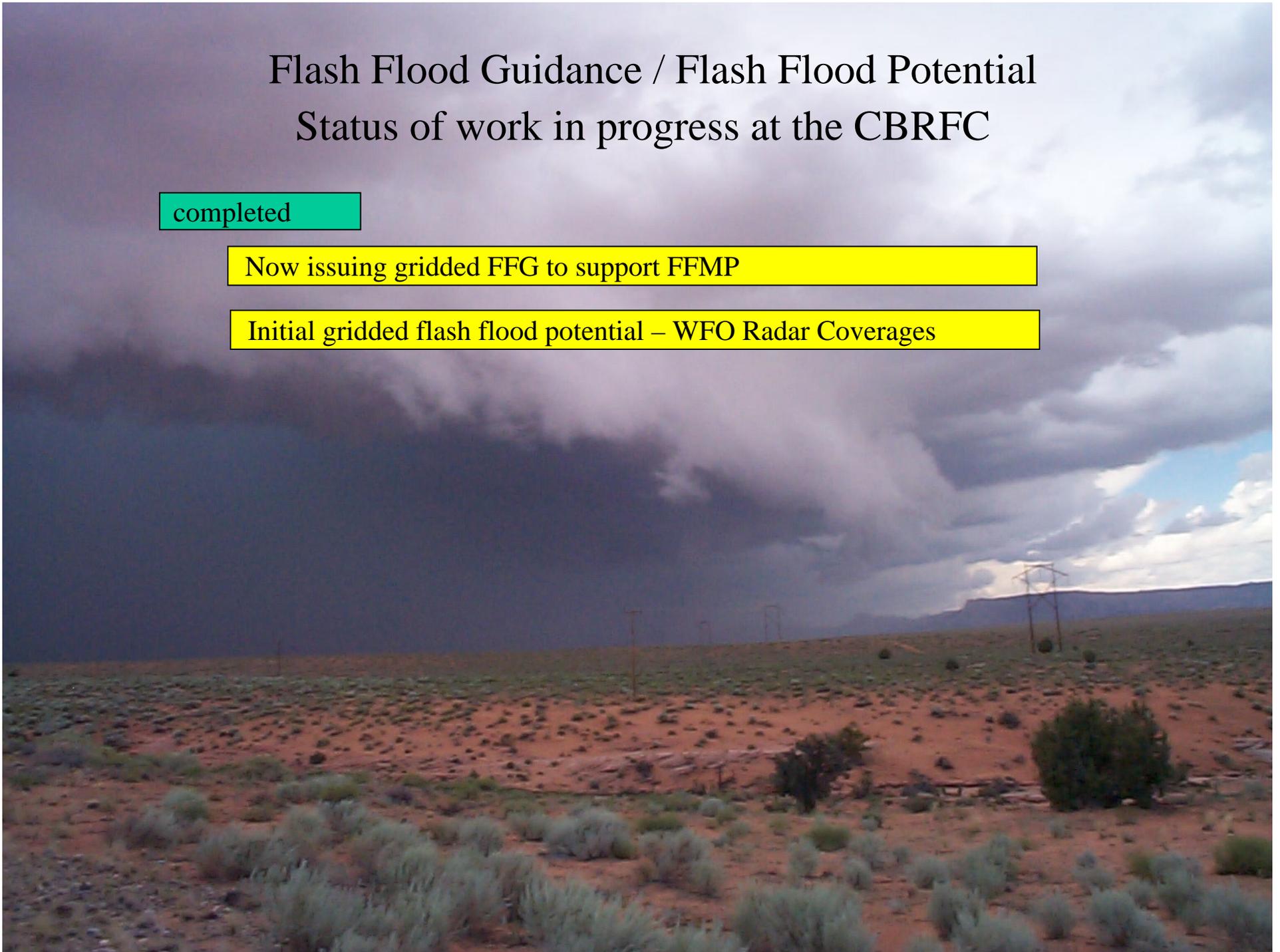
# Flash Flood Guidance / Flash Flood Potential

## Status of work in progress at the CBRFC

completed

Now issuing gridded FFG to support FFMP

Initial gridded flash flood potential – WFO Radar Coverages



Physiographic characteristics influence the hydrologic response of a basin to heavy rainfall



Gridded Flash Flood Potential



## Method (currently)

$$\text{RFFPI} = (1.5 * \text{slope} + 1.0 * \text{forest} + 1.0 * \text{soil} + 1.0 * \text{LU}) / \text{N}$$

RFFPI = Relative Flash Flood Potential Index

Slope = Percent Slope

Forest = Forest Cover

Soil = Soil Type (fractional soil grid)

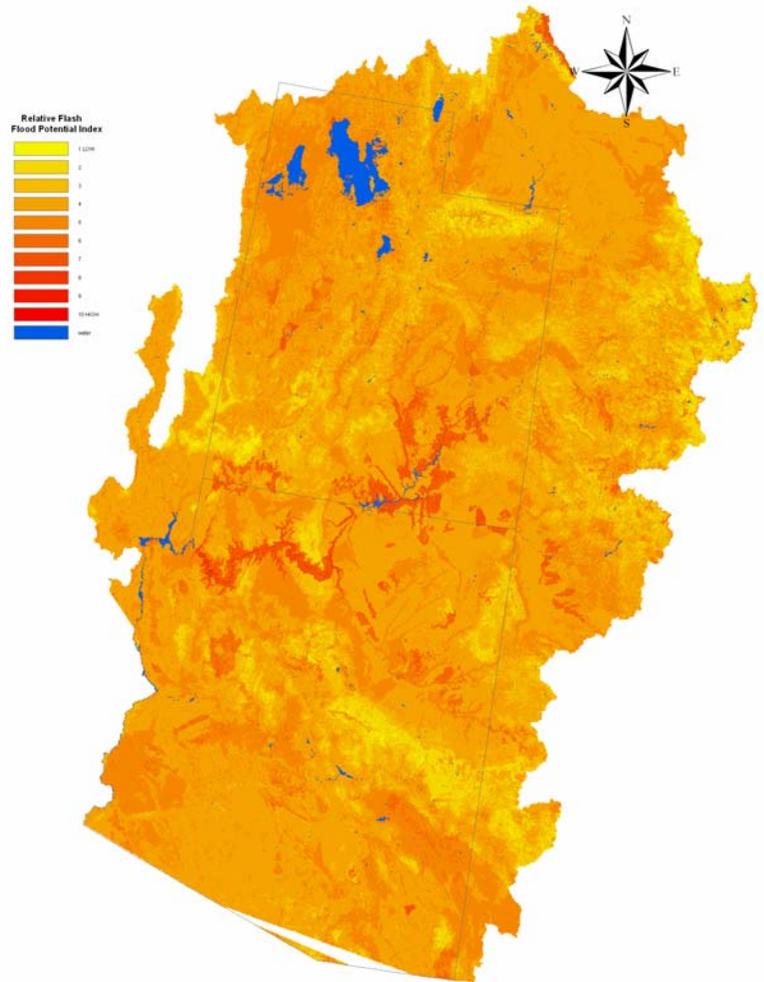
Land Use = Land Use Type

N = Number of Layers

More layers will be added

# Colorado Basin River Forecast Center Preliminary Gridded Relative Flash Flood Potential

Relative Hydrologic Response Based on Physiographic Characteristics

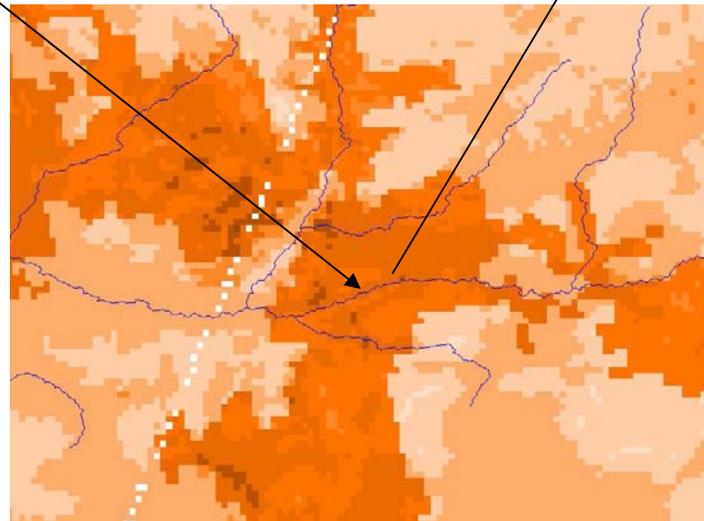
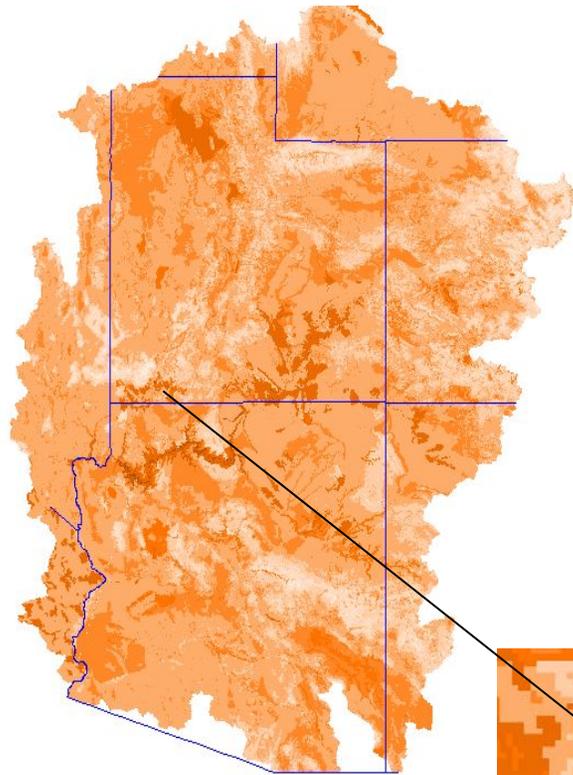


Based on:

- Forest Density Layer
- Soil Type Layer
- Percent Slope Layer
- Land Use Layer

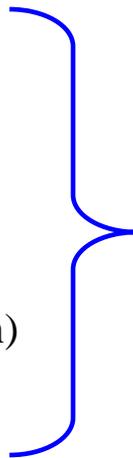
Aspen, Bullock, and Oracle Fire Burn Severity Levels Included

# Gridded –Relative– Flash Flood Potential

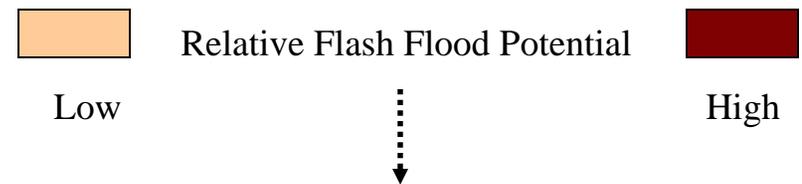
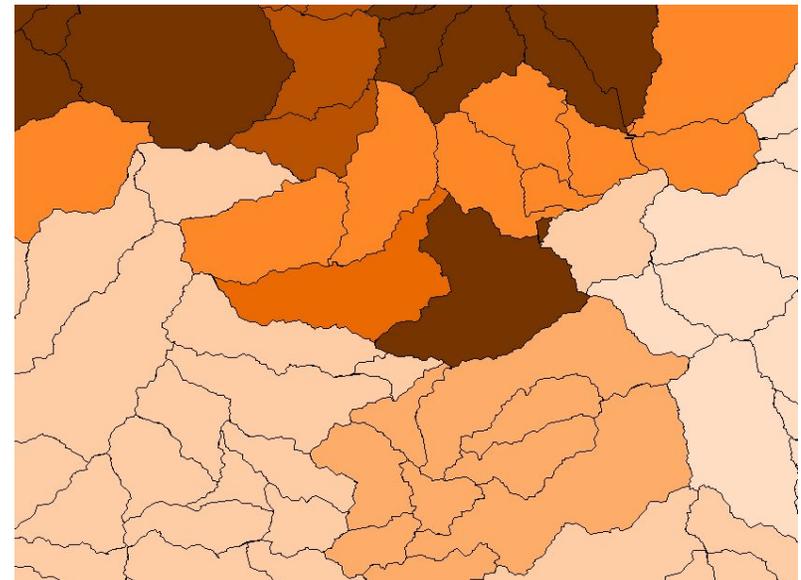


# Summarize Grids to FFMP Basin Layer

- STATSGO Dominant Soil Texture
- MLRC Land Use / Land Cover
- NOAA AVHRR Forest Density Grid
- USGS DEM (derived % slope Grid – Terrain)
- Fire Burn Areas / Severity coverage

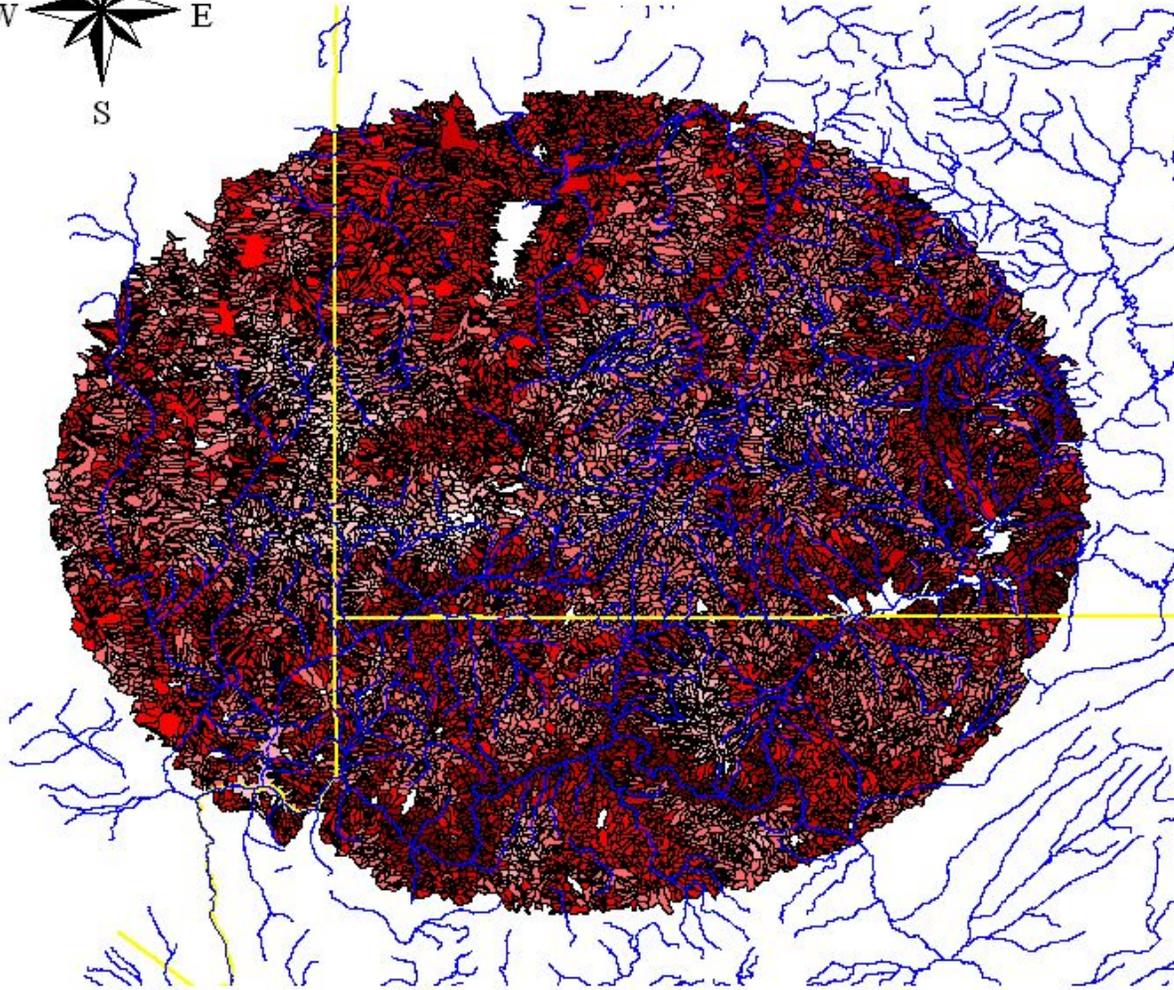


## FFMP Basins

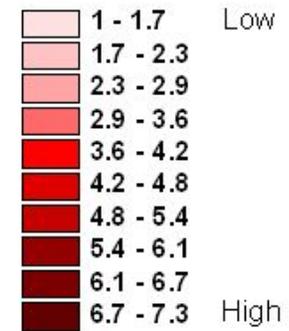


An indication of rapid hydrologic response

# KICX Cedar City Utah Radar Relative Flash Flood Potential



## KICX Relative Flash Flood Potential Index



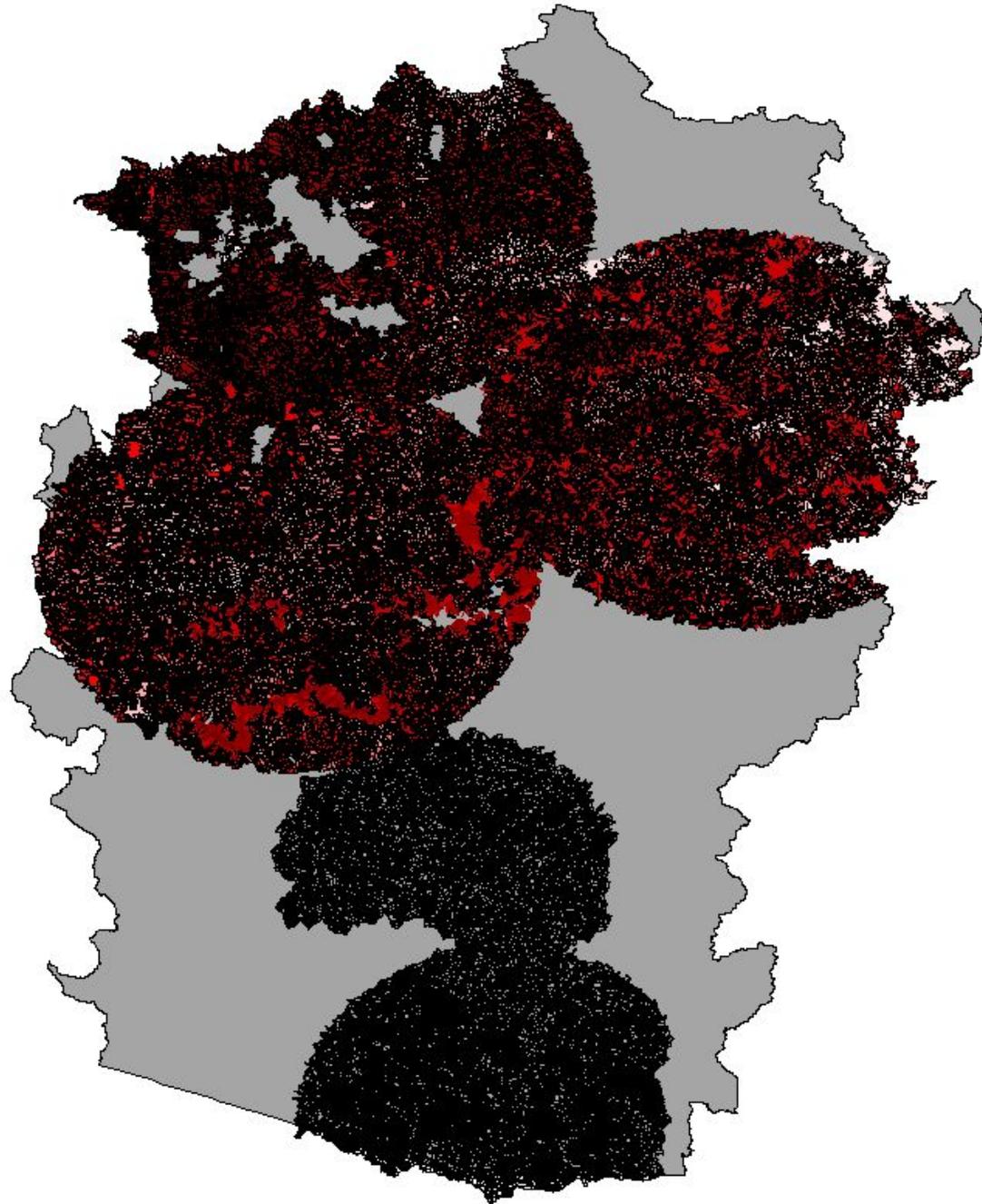


## **CBRFC – Flash Flood Potential Project**

- **Initial output tested by SLC WFO during Aug 2003 FF Events**
  - **FFPI displayed in ArcView and used concurrently with FFMP**
  - **Received favorable comments from forecasters as additional tool**
  - **Influenced successful decisions whether to warn or not**
  - **Desire for continued work and similar functionality in FFMP**

Relative FFPI FFMP  
Coverages available for:

- Salt Lake
- Cedar City
- Grand Junction
- Flagstaff
- Tucson



# Flash Flood Guidance / Flash Flood Potential

## Status of work in progress at the CBRFC

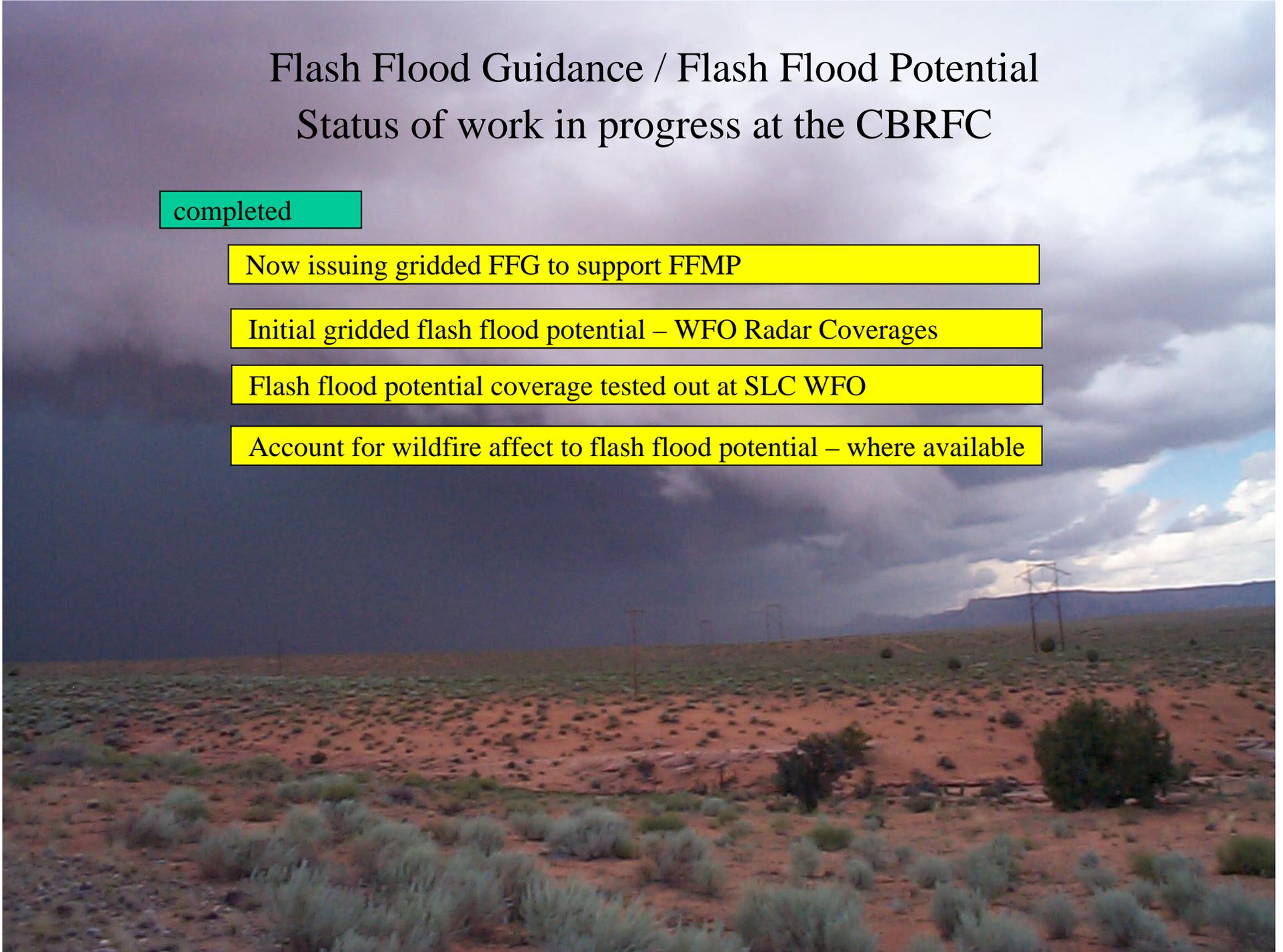
completed

Now issuing gridded FFG to support FFMP

Initial gridded flash flood potential – WFO Radar Coverages

Flash flood potential coverage tested out at SLC WFO

Account for wildfire affect to flash flood potential – where available



**High Burn Severity:**

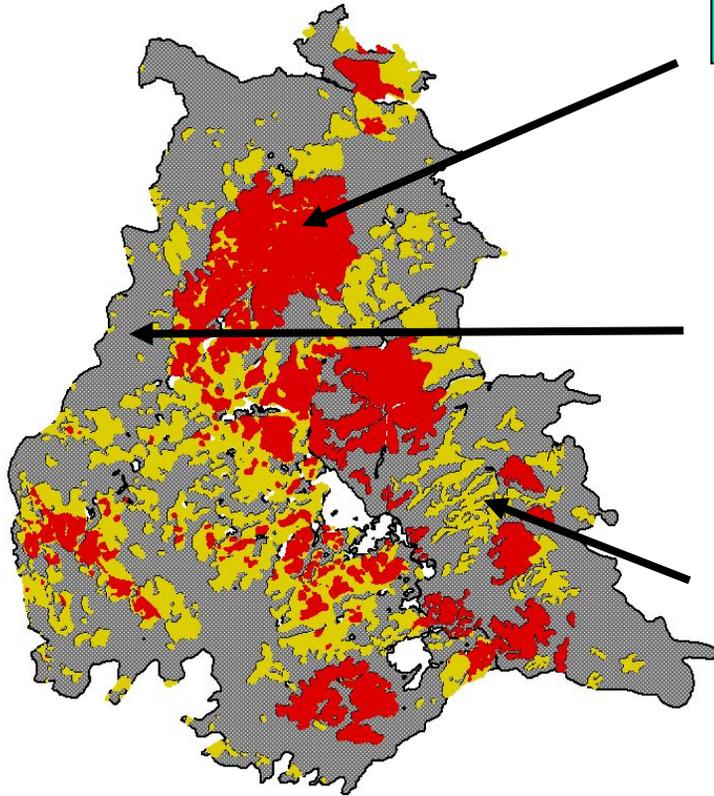
All vegetation blackened, deep soil heating killing roots/seeds, “baking” of the soil surface.

**Low Burn Severity:**

Most vegetation untouched by fire. No significant Effect on soil properties or water repellency.

**Moderate Burn Severity:**

Patchwork of green and burnt areas. Intermediate Between “high” and “low” severity levels.



## **The Challenge: How to apply fire burn severity information ?**

### **Forest Density Layer :**

- ♦ **High Burn Area – Completely removed forest density**

**Maximized hydrologic response for this layer**

- ♦ **Moderate Burn Areas - Reduced forest density by 50%**

**Moderate increase to hydrologic response for this layer**

- ♦ **Low or non burn areas – No change to existing forest density**

**No change to hydrologic response for this layer.**

## **The Challenge: How to apply fire burn severity information ?**

### **Soil Type Layer :**

- ♦ **High Burn Area – Assume hydrophobic soil**

**Maximized hydrologic response for this layer**

- ♦ **Moderate Burn Areas – Mix of baked / non-baked soil exists**

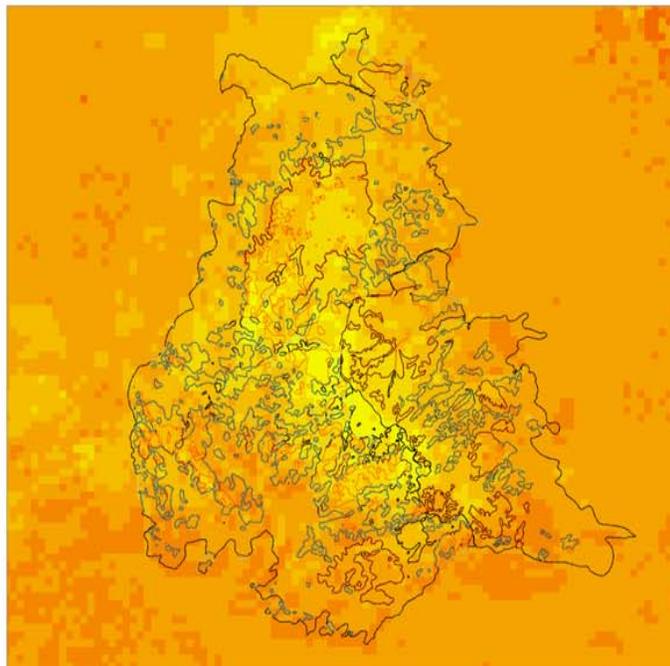
**Moderate increase to hydrologic response for this layer**

- ♦ **Low or non burn areas – No change to existing soil properties**

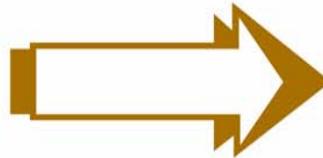
**No change to hydrologic response for this layer.**

# Affect of Fire on Hydrologic Response and Gridded Relative Flash Flood Potential

\* Preliminary Results \*



Burn Severity Layers Applied

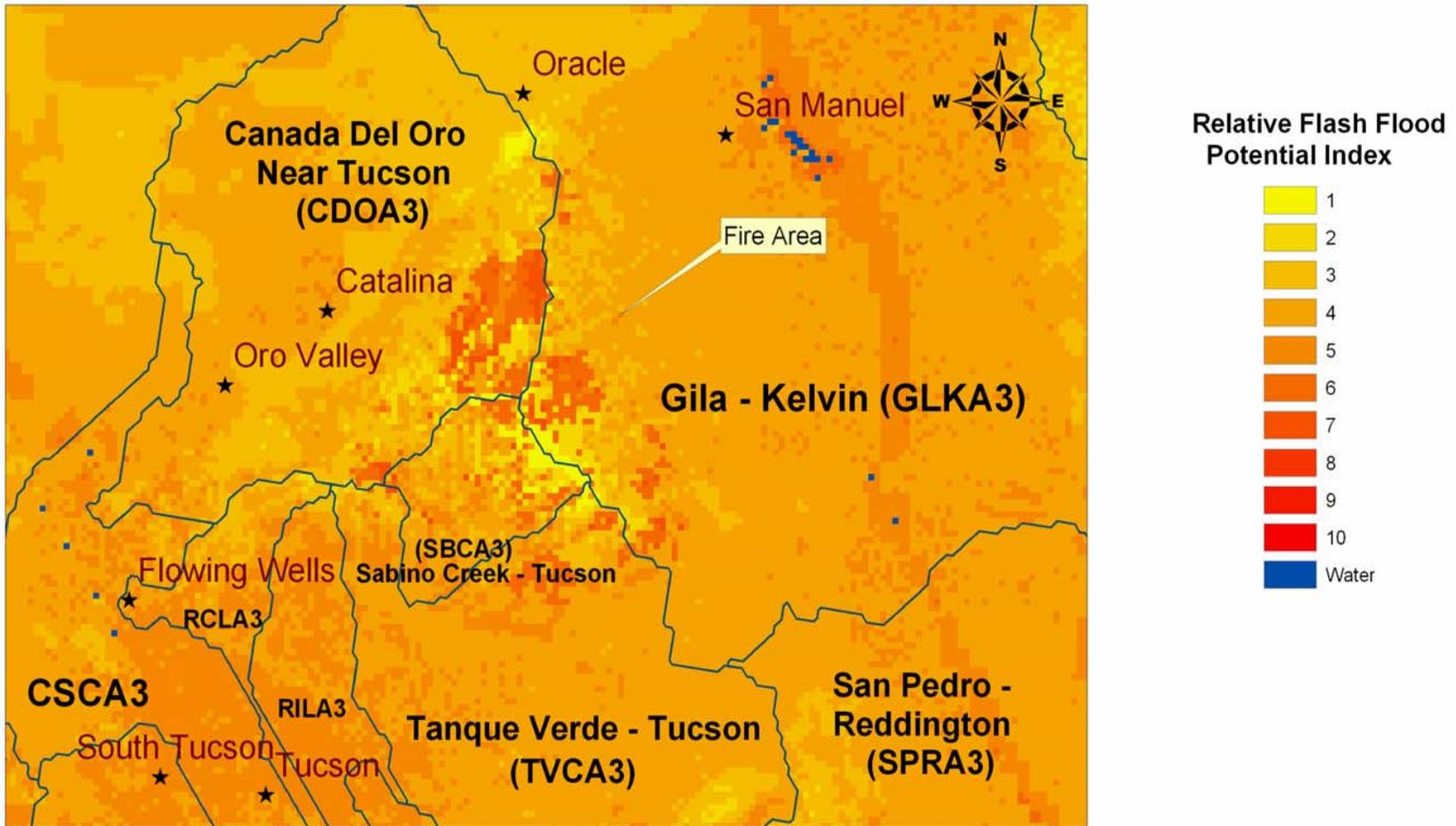


Relative Flash Flood Potential Index



Prepared by: Greg Smith - Colorado Basin River Forecast Center - NWS/NOAA

# CBRFC Modeled River Basins Within Aspen-Oracle-Bullock Fire Areas



# Flash Flood Guidance / Flash Flood Potential

## Status of work in progress at the CBRFC

### Completed

Now issuing gridded FFG to support FFMP

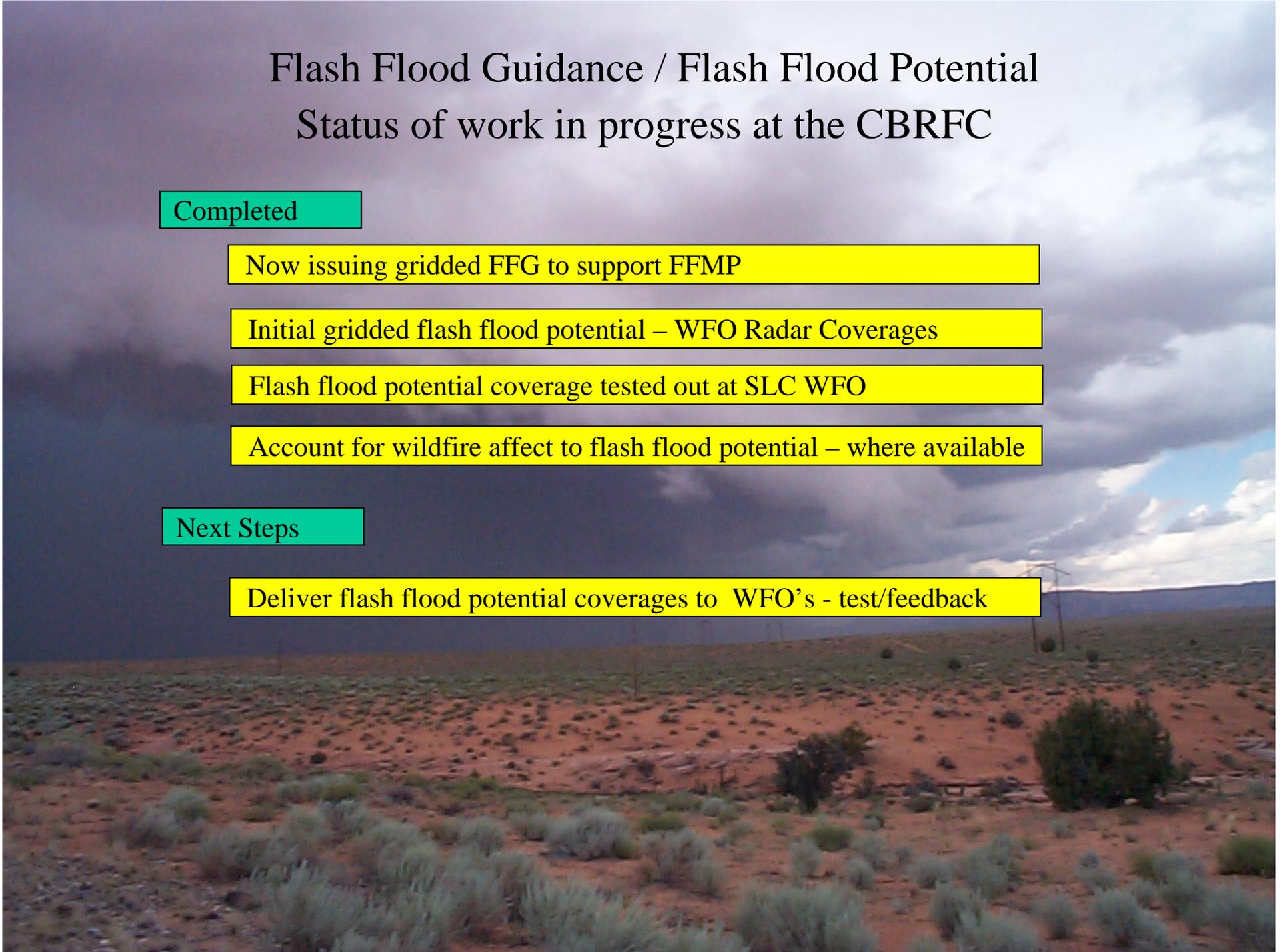
Initial gridded flash flood potential – WFO Radar Coverages

Flash flood potential coverage tested out at SLC WFO

Account for wildfire affect to flash flood potential – where available

### Next Steps

Deliver flash flood potential coverages to WFO's - test/feedback



# Delivering/Testing Flash Flood Potential Output

## System / Skill Requirements

- **Product is in a Shapefile format**
  - **FFMP does not have the ability to handle poly attributes**
- **ArcView is ‘probably’ simplest software to use**
  - **Requires certain minimum level of skills**
  - **Take advantage of overlaying additional geographic info.**
- **Hardcopy map for briefing is a possibility**
- **WFO FFMP basin coverages (Shapefile format) are needed**

# Flash Flood Guidance / Flash Flood Potential

## Status of work in progress at the CBRFC

### Completed

Now issuing gridded FFG to support FFMP

Initial gridded flash flood potential – WFO Radar Coverages

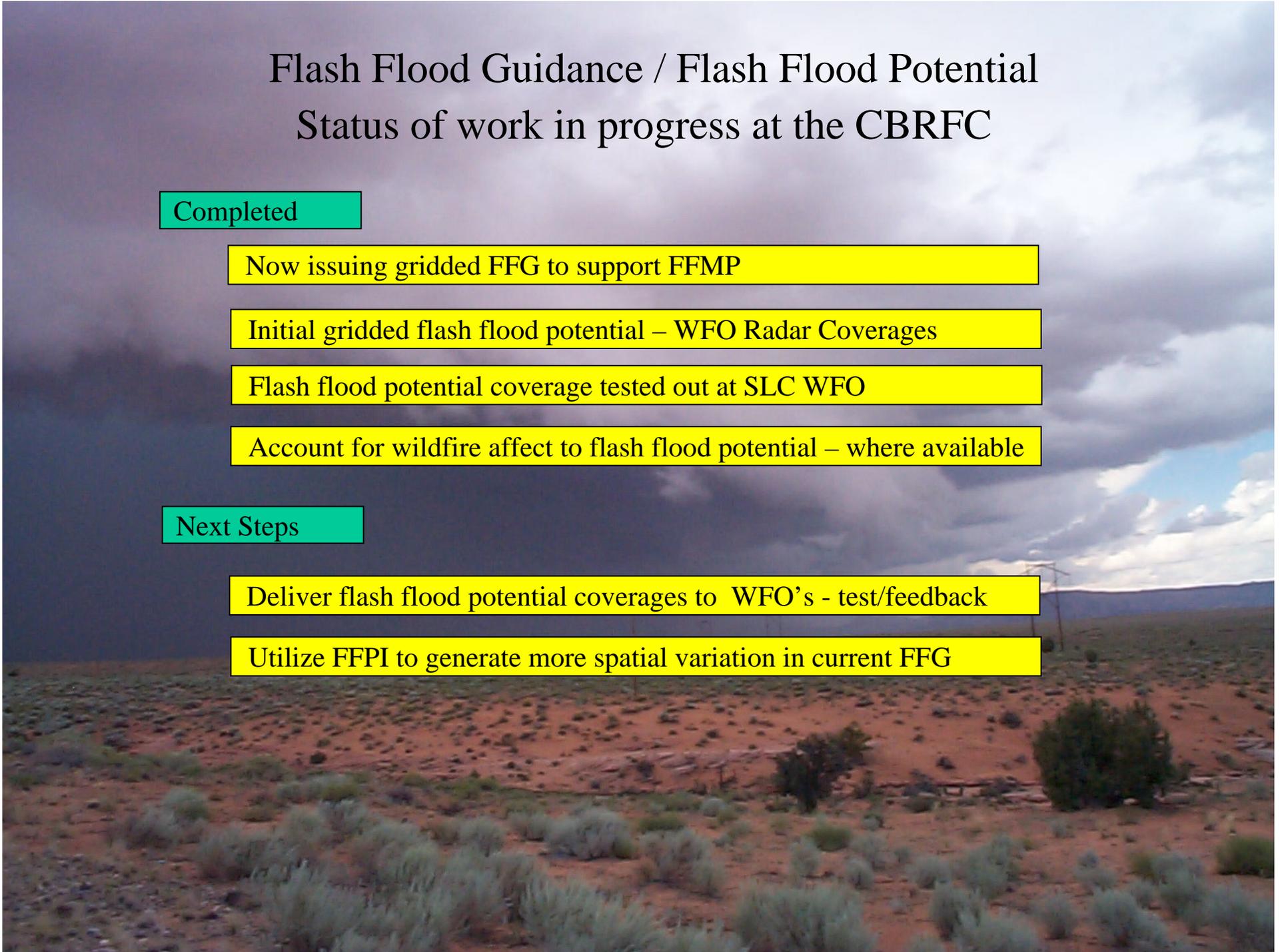
Flash flood potential coverage tested out at SLC WFO

Account for wildfire affect to flash flood potential – where available

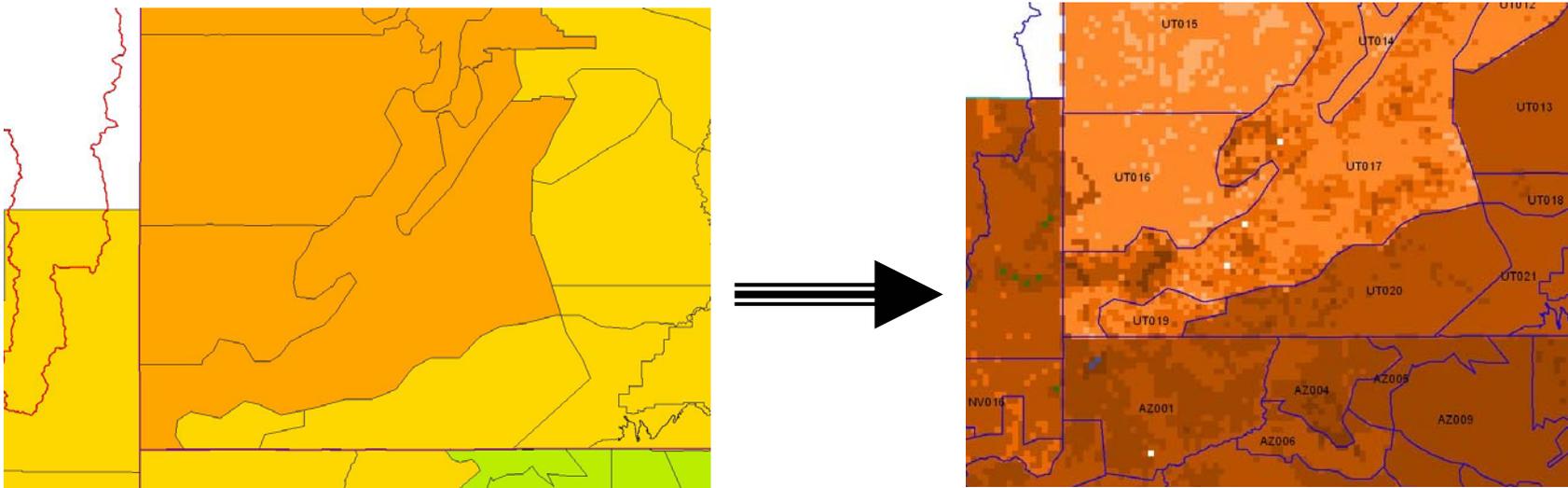
### Next Steps

Deliver flash flood potential coverages to WFO's - test/feedback

Utilize FFPI to generate more spatial variation in current FFG

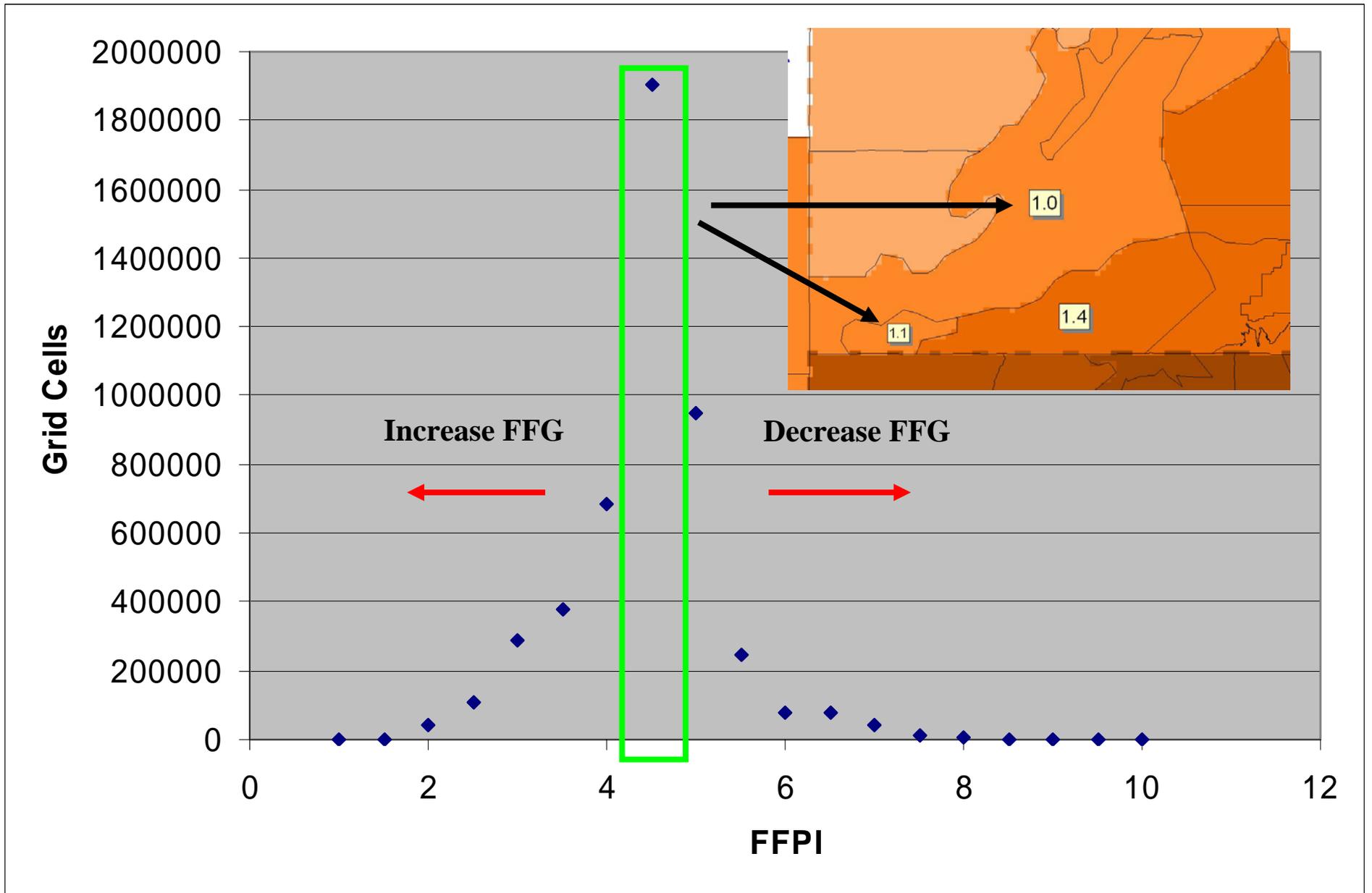


Next Step: Try to increase spatial variation of current FFG ?

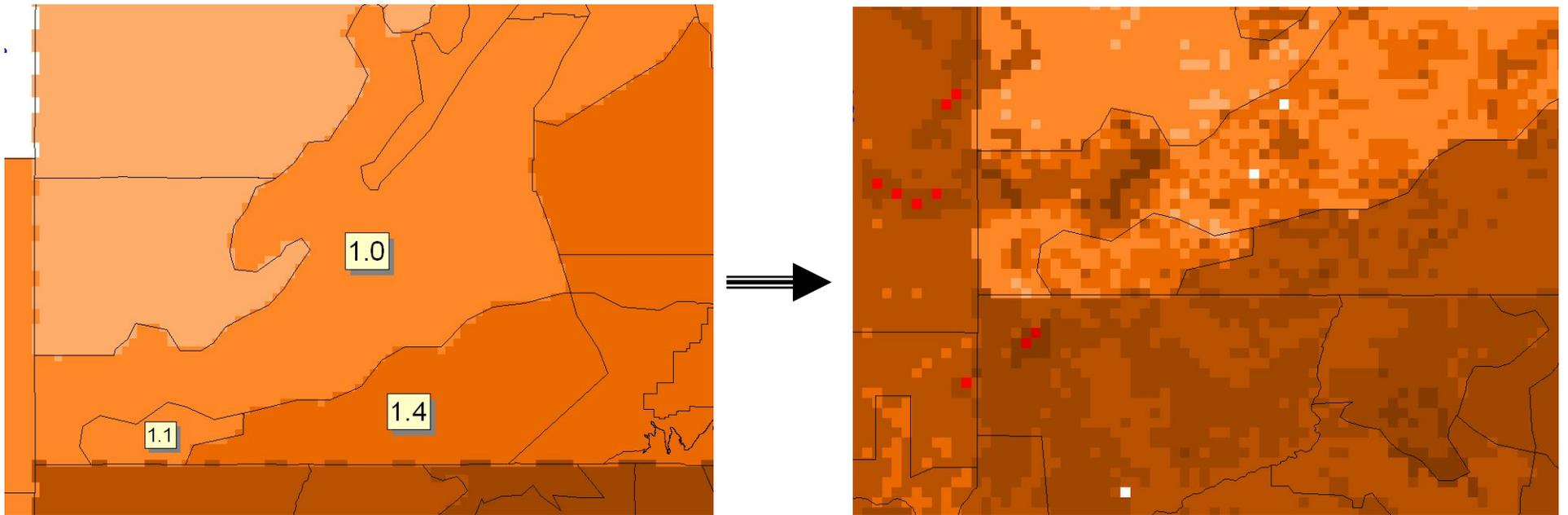


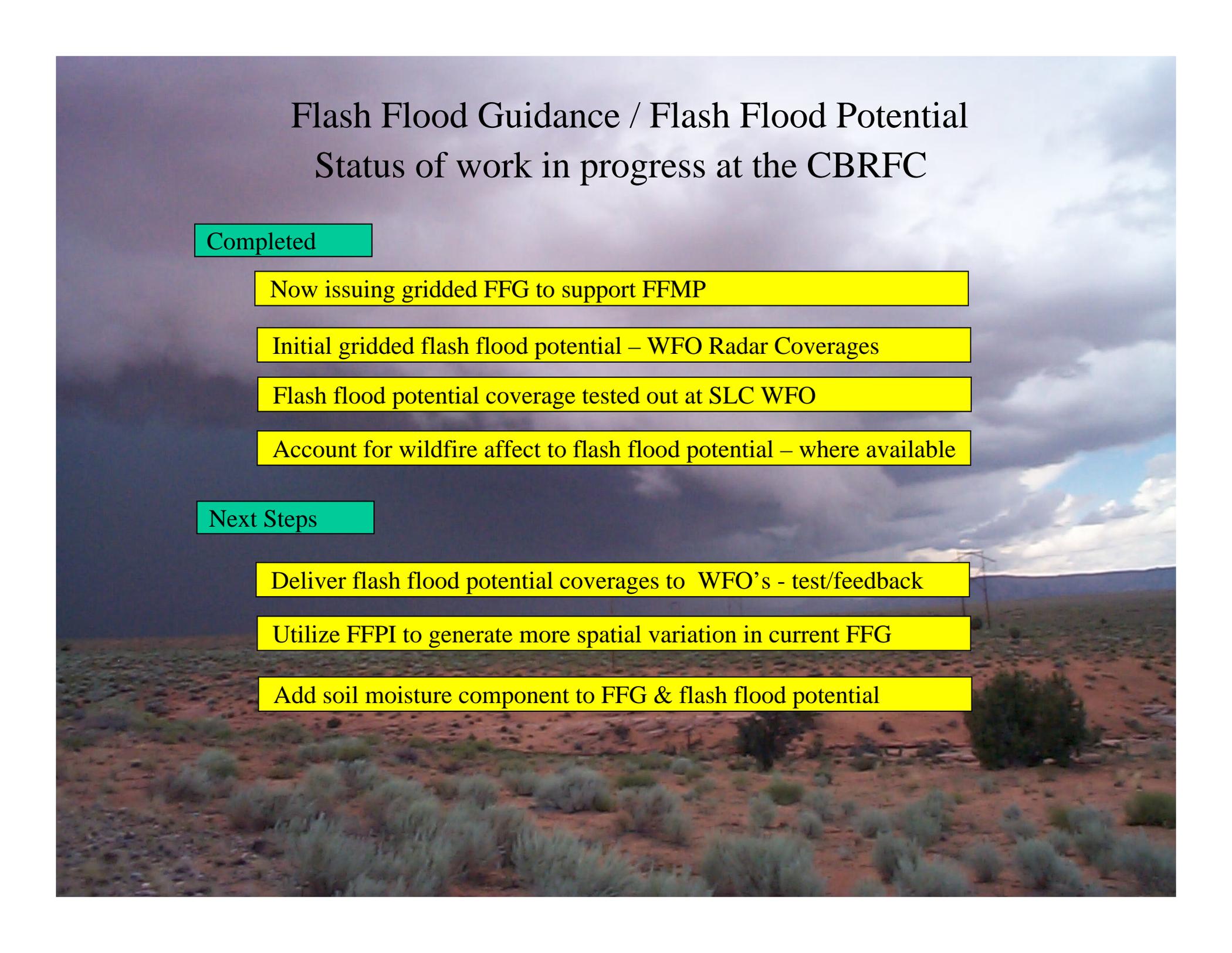
Utilize Relative Flash Flood  
Potential Index

# Apply FF potential grid to spatially vary current FFG



Apply FF potential grid to spatially vary current FFG





# Flash Flood Guidance / Flash Flood Potential

## Status of work in progress at the CBRFC

### Completed

Now issuing gridded FFG to support FFMP

Initial gridded flash flood potential – WFO Radar Coverages

Flash flood potential coverage tested out at SLC WFO

Account for wildfire affect to flash flood potential – where available

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Deliver flash flood potential coverages to WFO's - test/feedback

Utilize FFPI to generate more spatial variation in current FFG

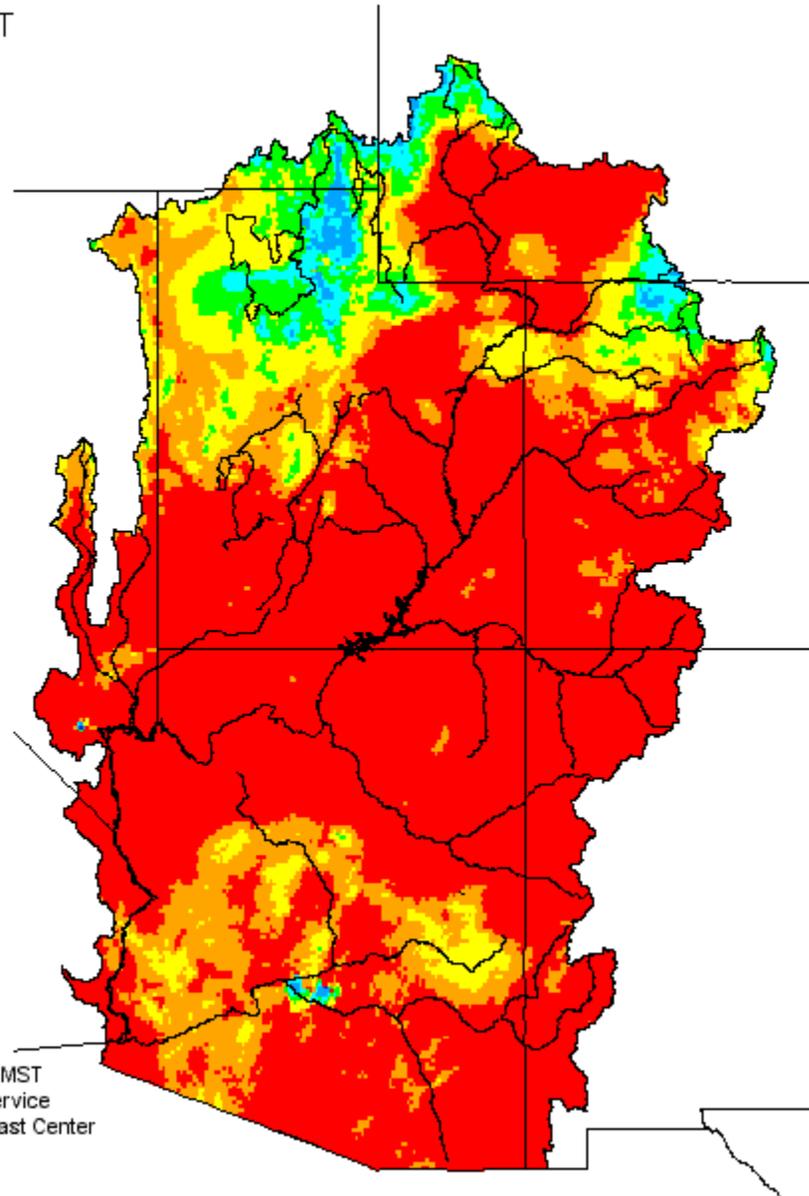
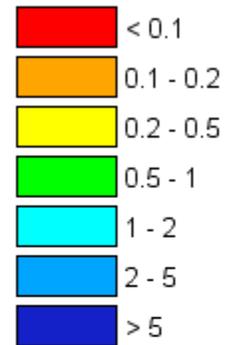
Add soil moisture component to FFG & flash flood potential

# Antecedent Precipitation Index (API)

Colorado Basin River Forecast Center

02/01/2003 12 GMT

## Legend



Prepared 10:51 02/01/2003 MST  
NOAA, National Weather Service  
Colorado Basin River Forecast Center  
Salt Lake City, Utah  
[www.cbrfc.noaa.gov](http://www.cbrfc.noaa.gov)

# Approximate Project Timetable

## Currently:

- Provide initial coverages to all CBRFC Forecast Offices for tests/feedback.
- Modifying gridded guidance for FFPI
- Acquire and database observed flash flood event data (interactive form for WFO 's)
- Generate themes from observed flash flood events for use in analysis

## May - July 2004

- Include gridded precipitation fields as soil moisture indicator for FFG & FFPI
- Generate new themes based on additional observed FF event data

## June - August 2004

- Additional objective analysis on existing/new datasets (finer resolution)
- Determine methodology for regular incorporation of fire severity data
- Re-issue updated flash flood potential coverages

## July-September 2004

- Develop regressions - Initial flash flood guidance values generated from RFFPI
- Operational testing - results analyzed – Future steps outlined